



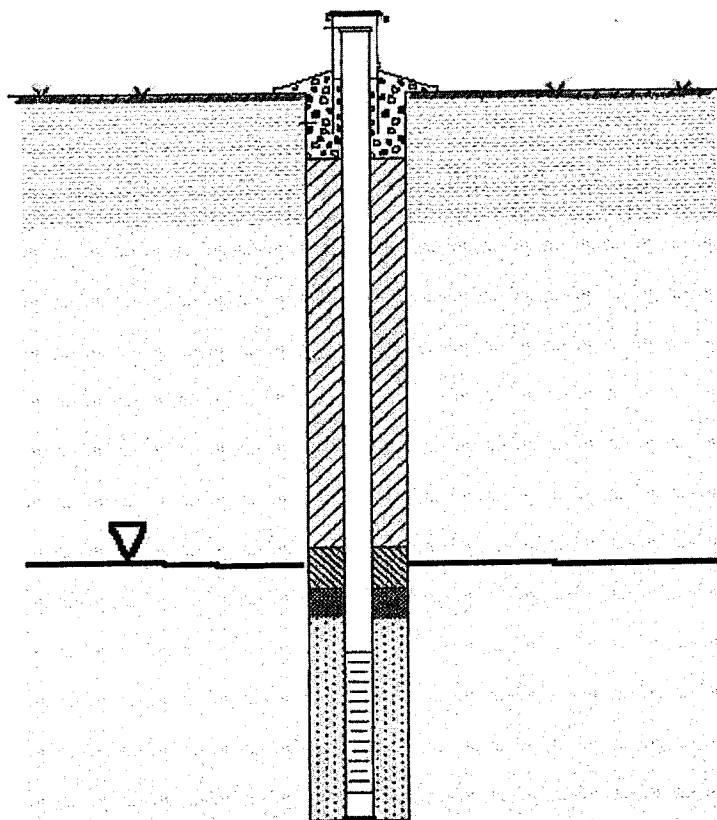
State of Ohio
Environmental Protection Agency

Division of Drinking and Ground Waters

Technical Guidance Manual for Ground Water
Investigations

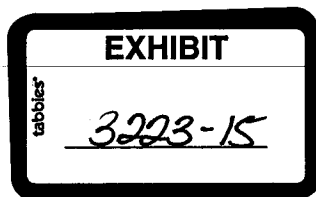
Chapter 7

Monitoring Well Design and Installation



February 2008

Governor : Ted Strickland
Director : Chris Korleski





**TECHNICAL GUIDANCE
MANUAL FOR
GROUND WATER INVESTIGATIONS**

CHAPTER 7

Monitoring Well Design and Installation

**February, 2008
Revision 1**

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PREFACE

This document is part of a series of chapters incorporated in Ohio EPA's *Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring* (TGM), which was originally published in 1995. DDAGW now maintains this technical guidance as a series of chapters rather than as an individual manual. The chapters can be obtained at <http://www.epa.state.oh.us/ddagw/tgmweb.aspx>

The TGM identifies technical considerations for performing hydrogeologic investigations and ground water monitoring at potential or known ground water pollution sources. The purpose is to enhance consistency within the Agency and inform the regulated community of the Agency's technical recommendations and the basis for them. In Ohio, the authority over pollution sources is shared among various Ohio EPA divisions, including the Emergency and Remedial Response (DERR), Hazardous Waste Management (DHWM), Solid and Infectious Waste (DSIWM), and Surface Water (DSW), as well as other state and local agencies. DDAGW provides technical support to these divisions.

Ohio EPA utilizes **guidance** to aid regulators and the regulated community in meeting laws, rules, regulations and policy. Guidance outlines recommended practices and explains their rationale. The Agency may not require an entity to follow methods recommended by this or any other guidance document. It may, however, require an entity to demonstrate that an alternate method produces data and information that meet the pertinent requirements. The procedures used to meet requirements usually should be tailored to the specific needs and circumstances of the individual site, project, and applicable regulatory program, and should not comprise a rigid step-by-step approach that is utilized in all situations.

with 8 to 30 percent effective porosities, continuous slot screens are preferred, although not required. A high percentage of open area is of greater importance when wells are installed in fine-grained formations where smaller slot sizes and fine-grained filter packs are required (Nielsen and Schalla, 2006).

Pre-Packed Screen Wells

A pre-packed screen is an assembly consisting of an inner slotted screen surrounded by a wire mesh sleeve that acts as a support for filter media. The pre-packed screen assemblies can either be shipped with filter media already packed within the mesh sleeve or can be shipped without filter media and packed with filter sand in the field. Refer to ASTM D5092-04 for appropriate sizing of filter pack material. Pre-packed well screens help eliminate problems in the placement of filter pack around the screens of small diameter wells. In fine-grained formations pre-packed screens may be best for ensuring proper filter pack placement.

(ASTM D5092-04). The wells are sealed and grouted using the same procedure described for conventionally completed DPT wells. ASTM D6725-04 provides additional guidance on the use of pre-packed wells.

Slot Size

When selecting a screen slot size for an artificially filter-packed well, a sieve analysis should be conducted on the pack material. The selected size should retain at least 90% of the pack. In many situations it is preferable to retain 99% (Nielsen and Schalla, 2006 and ASTM D 5092-90, 1994). See Table 7.1 for a guide to the selection of slot sizes for various packs.

For naturally-packed wells, the screen should retain at least 70% of the pack (Nielsen and Schalla, 2006, ASTM D5092-04). For additional information on pack and screen selection, see Aller et al. (1991), Nielsen and Schalla, (2006), and ASTM D 5092-90 (1994).

It should be noted that if a PTFE screen is used in a deep well, a slightly larger slot size than predicted should be selected due to the material's lower compressive strength, which allows the openings to compress (Dablow et al., 1988).

Length

Screen length should be tailored to the desired zone and generally should not exceed 10 ft. A 2 to 5 ft. screen is desirable for more accurate sampling and discrete head measurements. Longer screens produce composite samples that may be diluted by uncontaminated water. As a result, concentrations of contaminants may be underestimated. In addition, if vertical flow is present, the well screen may provide a pathway for redistribution of contaminants, and possible cross-contamination of the formation (Nielsen and Schalla, 2006). Furthermore, the screen should not extend through more than one water-bearing zone to avoid cross-contamination. When a thick formation must be monitored, a cluster of individual, closely spaced wells, screened at various depths, can be installed to monitor the entire formation thickness. The length of screens that monitor the water table surface should account for seasonal fluctuation of the water table. For related information on screen length, refer to Chapter 5 – Monitoring Well Placement.

MAJOR CHANGES FROM THE FEBRUARY 1995 TGM

The Ohio EPA Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring (TGM) was finalized in 1995. This guidance document represents an update to Chapter 7 (Monitoring Well Design and Installation). Listed below are the major changes from the 1995 version.

1. Deleted language cautioning against the use of multi-level wells. Added information on multi-level well systems.
2. Added text indicating that vertical water profiles can be obtained with passive sampling techniques.
3. Revised text to state that PVC is preferable to PTFE for monitoring well screens when organics are present. Studies have shown that PTFE sorbs organic compounds at a higher rate than does PVC.
4. Added language stating that a filter pack can be much less thick than previously recommended.
5. Added language describing the use of pre-packed screen wells.
6. Changed the recommendation for selecting the screen slot size of a naturally packed well from a slot that retains 30 to 60% of the filter pack to one that retains 70%.
7. Added information on methods for creating high-solids bentonite.
8. Revised text to note potential problems with using a bentonite/cement mixture. However, the guidance does not rule it out as a potential sealant for monitoring wells. Some literature has indicated problems with the use of a bentonite as an additive to neat cement for well sealing. Because of this, the Ohio rules applying to drinking water wells do not allow the use of a bentonite/cement mixture (OAC 3745-09). However, there are also articles that favor its use, and many states still allow (and recommend) it.
9. Added section on procedures for installation of neat cement grout.
10. Added recommendation that, due to its potential to affect ground water chemistry, bentonite sealing material should be placed a minimum of 3 to 5 feet above the top of the well screen.
11. Included references to new documents that have become available since 1995, including:
 - Updated existing references.
 - Added new ASTM reference for installation of pre-packed screens.
 - Added new ASTM reference for maintenance and rehabilitation of ground water monitoring wells.
 - Added reference to the Technical Guidance for Ground Water Investigation Chapter 15 - Use of Direct Push Technologies for Soil and Ground Water Sampling.

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